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Heo et al.

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(54) **ORGANIC LIGHT EMITTING DISPLAY DEVICE WITH REDUCED GENERATION OF PARASITIC CAPACITANCE AND METHOD FOR MANUFACTURING THE SAME**

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CPC **H01L 27/3276** (2013.01)

(58) **Field of Classification Search**
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USPC 313/504
See application file for complete search history.

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(57) **ABSTRACT**

An organic light emitting diode (OLED) display includes: a substrate; a first and a second thin film transistor (TFT) both disposed on the substrate and both having an active layer, a gate, a source and a drain electrode. A gate line is connected to the gate electrode of the first TFT, and a data line is connected to the source electrode of the first TFT. A common power source line is connected to the source electrode of the second TFT, intersects the gate line, and is parallel to the data line. A pixel electrode is connected to the drain electrode of the second TFT. An organic emission layer is disposed on the first electrode. A common electrode line is disposed on the organic emission layer. A secondary common power source line is formed with the same material as and is parallel to the common electrode line.

14 Claims, 8 Drawing Sheets

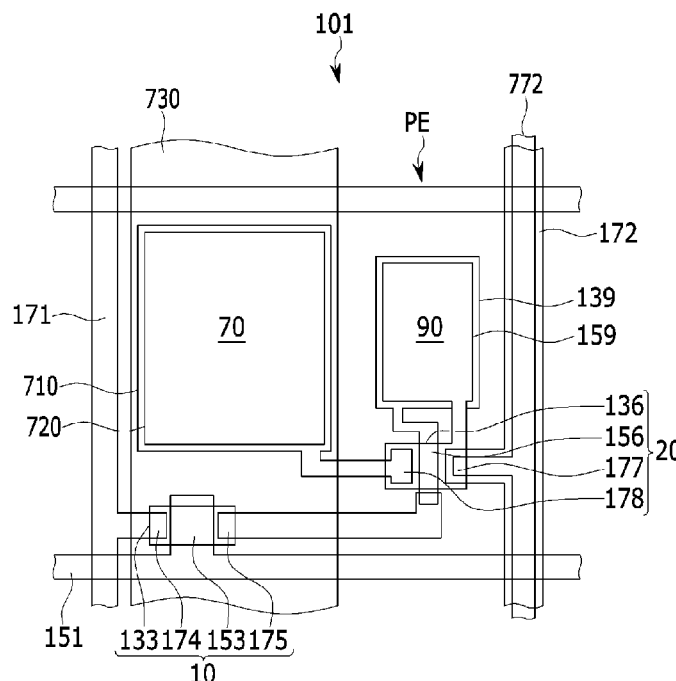


FIG. 1

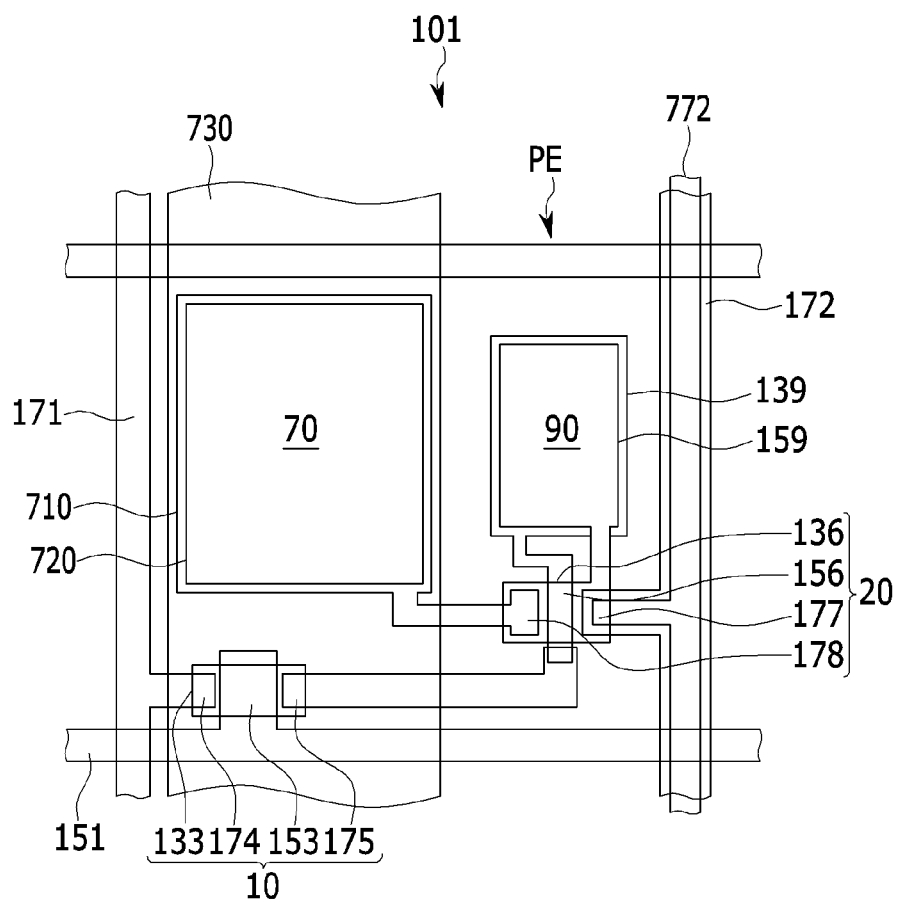


FIG. 2

101

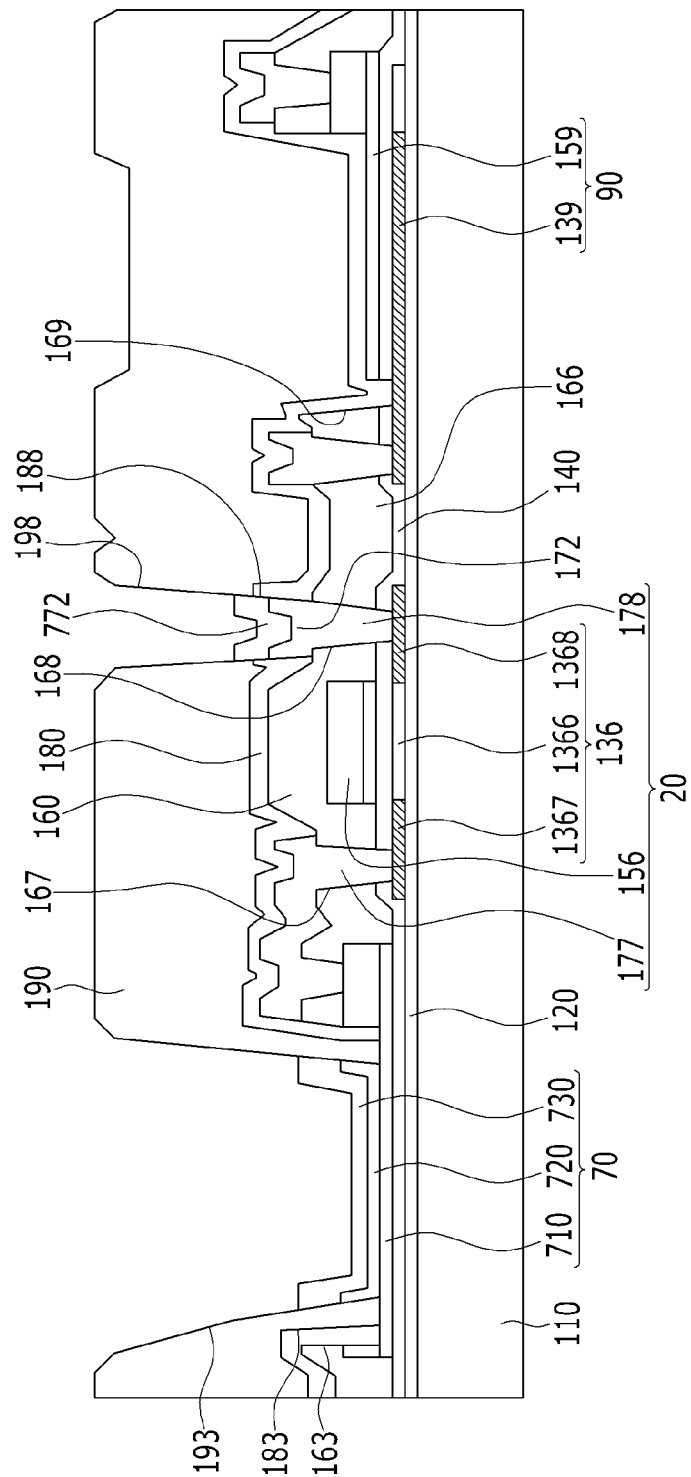


FIG. 3

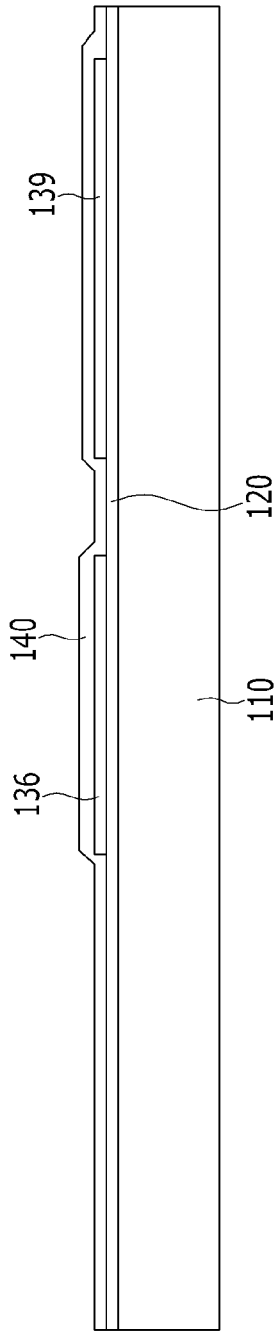


FIG. 4

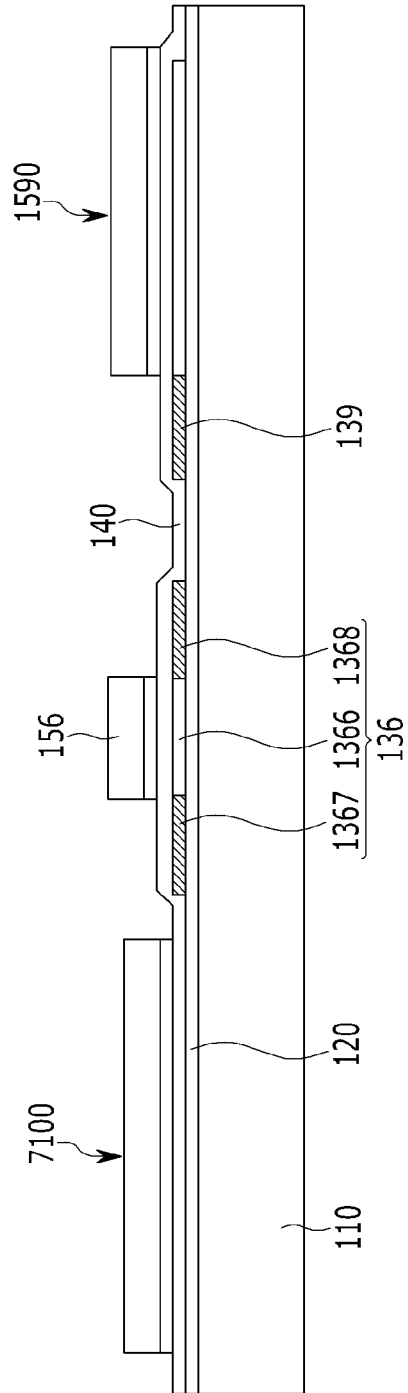


FIG. 5

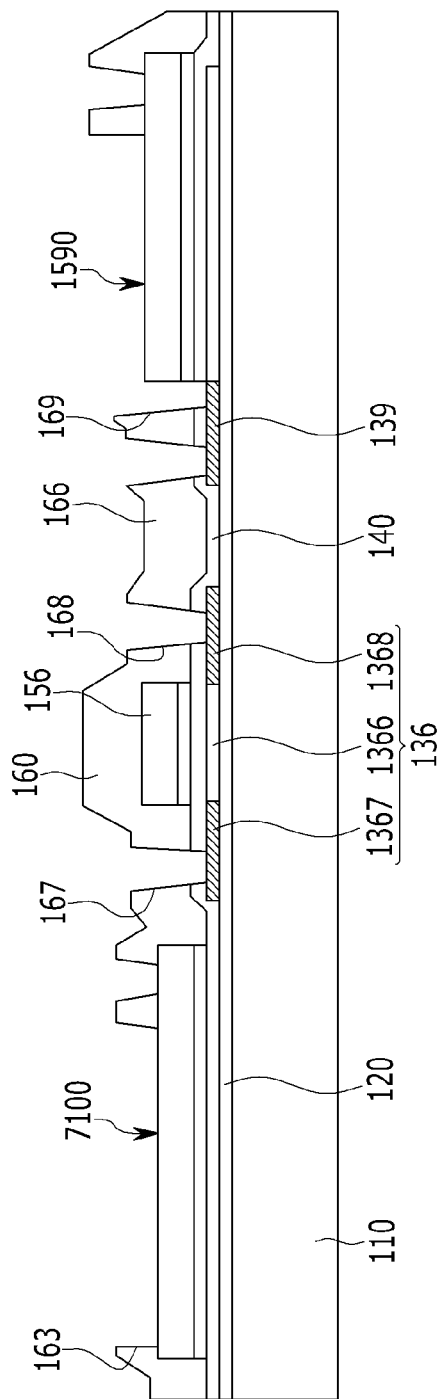


FIG. 7

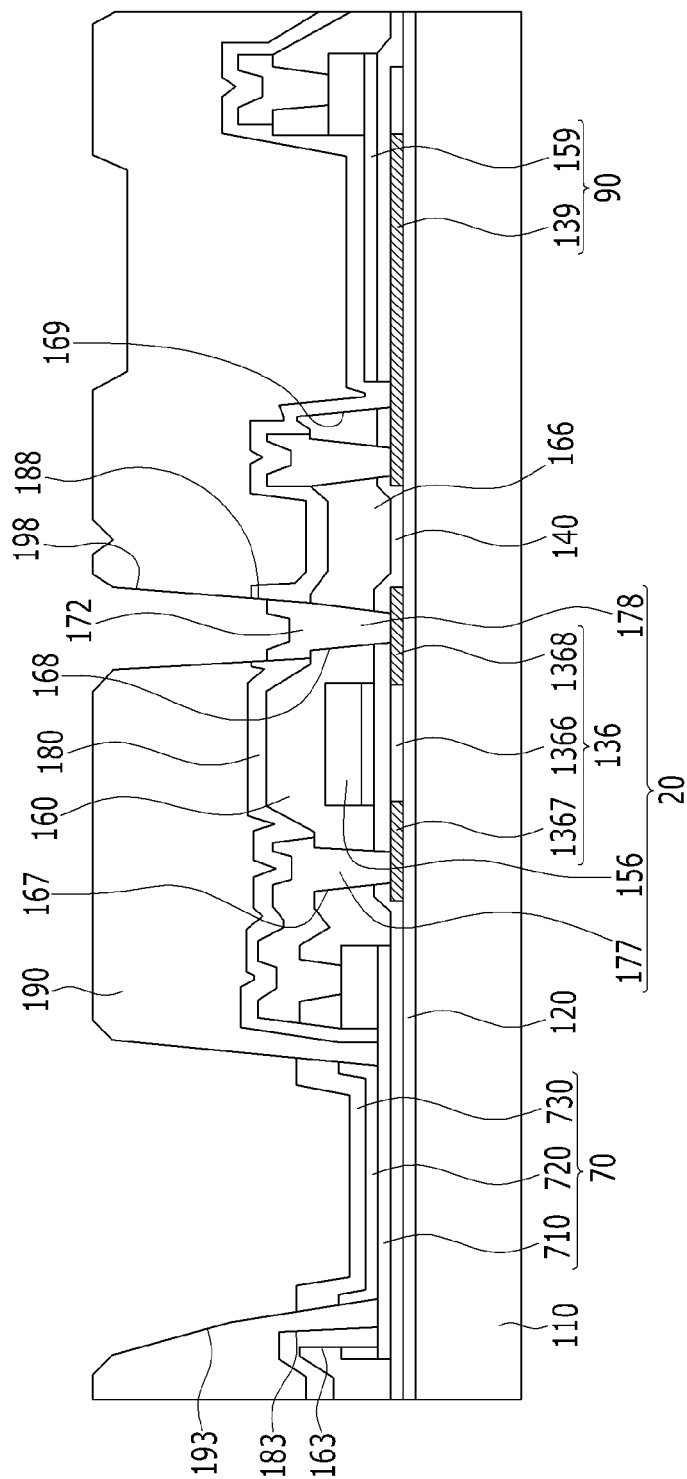
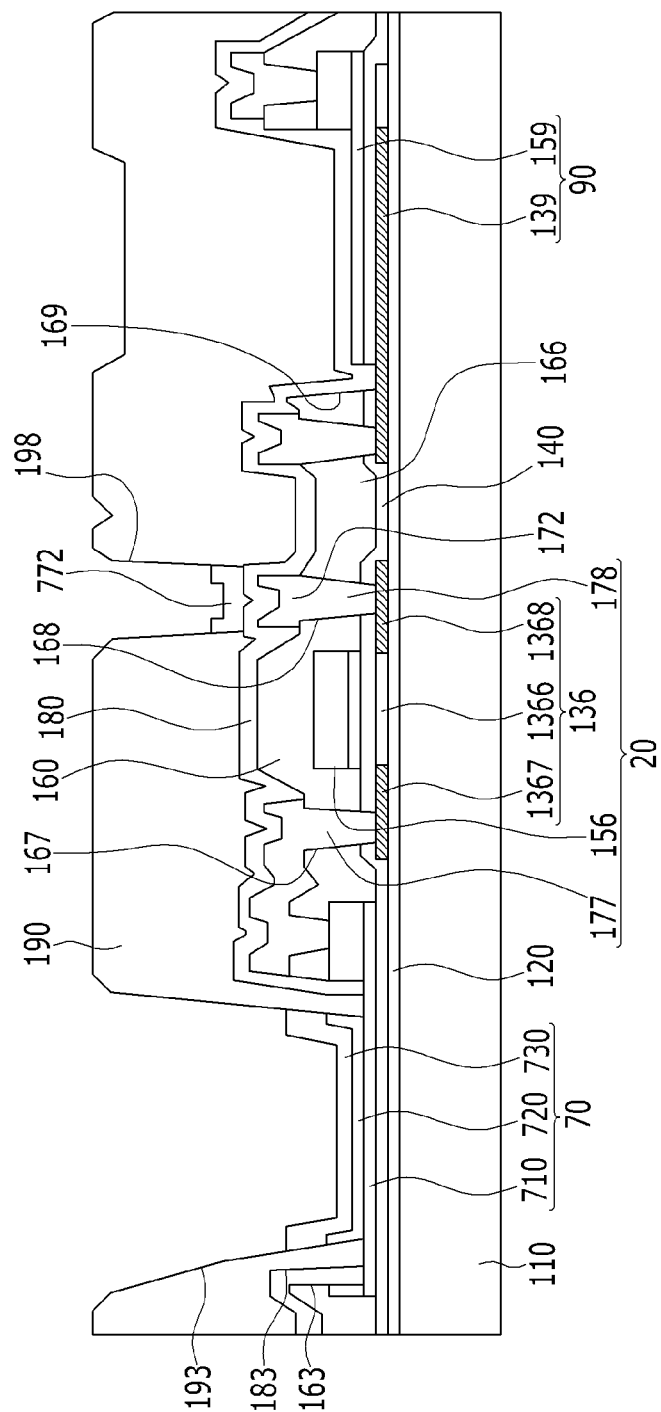


FIG. 8

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**ORGANIC LIGHT EMITTING DISPLAY
DEVICE WITH REDUCED GENERATION OF
PARASITIC CAPACITANCE AND METHOD
FOR MANUFACTURING THE SAME**

CROSS-REFERENCE TO RELATED
APPLICATIONS

This application claims priority to and the benefit of Korean Patent Application No. 10-2011-0082257 filed in the Korean Intellectual Property Office on Aug. 18, 2011, the entire contents of which are incorporated herein by reference.

BACKGROUND

1. Field

The present disclosure relates generally to an organic light emitting diode (OLED) display and a manufacturing method thereof. More particularly, the described technology relates generally to an organic light emitting diode (OLED) display with minimized generation of unnecessary parasitic capacitance, and a manufacturing method thereof.

2. Description of the Related Technology

Organic light emitting diode (OLED) displays have garnered much attention as a next-generation display because of their merits such as wide viewing angle, fast response rate, and relatively less power consumption, as well as a lower weight and a slim size.

An organic light emitting diode (OLED) display generally includes a thin film transistor and a capacitor, as well as an organic light emitting element. A cathode of the organic light emitting element is deposited on the whole surface such that the cathode overlaps the capacitor.

Accordingly, an unnecessary parasitic capacitance is generated between an electrode of the capacitor and the cathode.

The above information disclosed in this Background section is only for enhancement of understanding of the background of the described technology and therefore it may contain information that does not form the prior art that is already known in this country to a person of ordinary skill in the art.

SUMMARY OF CERTAIN INVENTIVE ASPECTS

One embodiment provides an organic light emitting diode (OLED) display with minimized unnecessary parasitic capacitance.

An organic light emitting diode (OLED) display with a suppressed voltage drop is also provided.

Further, a manufacturing method of the above organic light emitting diode (OLED) displays is provided.

According to an one embodiment, an organic light emitting diode (OLED) display includes: a substrate; a first thin film transistor and a second thin film transistor disposed on the substrate and having an active layer, a gate electrode, a source electrode, and a drain electrode; a gate line connected to the gate electrode of the first thin film transistor; a data line connected to the source electrode of the first thin film transistor and intersecting the gate line; a common power source line connected to the source electrode of the second thin film transistor, intersecting the gate line, and being parallel to the data line; a pixel electrode connected to the drain electrode of the second thin film transistor and being isolated; an organic emission layer disposed on the first electrode; a common electrode line disposed on the organic emission layer and parallel to the data line and the common power source line; and a secondary common power source line formed with the

same material as and parallel to the common electrode line on the common power source line.

The organic light emitting diode (OLED) display can further include a capacitor disposed in a space between the common electrode line and the secondary common power source line.

The capacitor can include: a first capacitor electrode formed with the same layer as the active layer of the first thin film transistor and the second thin film transistor and connected to the drain electrode of the first thin film transistor and the gate electrode of the second thin film transistor; and a second capacitor electrode formed with the same layer as the pixel electrode and the gate electrode and connected to the source electrode of the second thin film transistor and the common power source line.

In the organic light emitting diode (OLED) display, the secondary common power source line can be formed directly on the common power source line.

The organic light emitting diode (OLED) display can further include a protecting insulating layer disposed between the secondary common power source line and the common power source line.

According to another embodiment, an organic light emitting diode (OLED) display includes: a substrate; a semiconductor layer pattern disposed on the substrate and including an active layer and a first capacitor electrode; a gate insulating layer disposed on the semiconductor layer pattern; a first conductive layer pattern disposed on the gate insulating layer and including a gate line, a pixel electrode, a gate electrode, and a second capacitor electrode; an interlayer insulating layer disposed on the first conductive layer pattern and having a pixel interlayer opening region exposing a portion of the pixel electrode; a second conductive layer pattern including a source electrode, a drain electrode, a data line, and a common power source line disposed on the interlayer insulating layer; a protecting insulating layer disposed on the second conductive layer pattern and having a pixel protecting opening region exposing a portion of the pixel electrode; a pixel defining layer disposed on the protecting insulating layer and having a pixel opening exposing a portion of the pixel electrode along with the pixel interlayer opening region and the pixel protecting opening region, and a line opening disposed on the common power source line; an organic emission layer disposed on the pixel electrode exposed through the pixel opening of the pixel defining layer; a common electrode line disposed on the organic emission layer and not overlapping a first capacitor electrode and a second capacitor electrode; and a secondary common power source line formed according to the common power source line in the line opening of the pixel defining layer.

The secondary common power source line can be disposed on the common power source line via the protecting insulating layer.

The protecting insulating layer can further include a line opening region exposing the common power source line along with the line opening of the pixel defining layer.

The secondary common power source line can be formed directly on the common power source line.

In the organic light emitting diode (OLED) display, the common electrode line can intersect the gate line and may be parallel to the data line and the common power source line.

According to another embodiment, a manufacturing method of an organic light emitting diode (OLED) display includes: providing a substrate; forming a semiconductor layer pattern including an active layer and a first capacitor electrode on the substrate; forming a gate insulating layer on the semiconductor layer pattern; forming a first conductive

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layer pattern including a gate line, a pixel electrode, a gate electrode, and a second capacitor electrode on the gate electrode; forming an interlayer insulating layer having a pixel interlayer opening region exposing a portion of the pixel electrode on the first conductive layer pattern; forming a second conductive layer pattern including a source electrode, a drain electrode, a data line, and a common power source line on the interlayer insulating layer; forming a protecting insulating layer having a pixel protecting opening region exposing a portion of the pixel electrode along with the pixel interlayer opening region on the second conductive layer pattern; forming a pixel defining layer having a pixel opening exposing a portion of the pixel electrode along with the pixel interlayer opening region and the pixel protecting opening region, and a line opening formed on the common power source line on the protecting insulating layer; forming an organic emission layer on the pixel electrode exposed through the pixel opening of the pixel defining layer; forming a common electrode line that does not overlap a first capacitor electrode and a second capacitor electrode on the organic emission layer; and forming a secondary common power source line according to the common power source line in the line opening of the pixel defining layer.

The secondary common power source line can be formed on the common power source line via the protecting insulating layer.

The protecting insulating layer can further include a line opening region exposing the common power source line along with the line opening of the pixel defining layer.

The secondary common power source line can be formed directly on the common power source line.

In the manufacturing method of the organic light emitting diode (OLED) display, the common electrode line can intersect the gate line and can be parallel to the data line and the common power source line.

According to some embodiments, the organic light emitting diode (OLED) display can have minimized generation of unnecessary parasitic capacitance.

Also, the organic light emitting diode (OLED) display can have a suppressed voltage drop.

Further, the organic light emitting diode (OLED) display can be effectively manufactured.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a layout view of a pixel area of an embodiment of an organic light emitting diode (OLED) display.

FIG. 2 is an enlarged cross-sectional view of the thin film transistor, the capacitor, and the organic light emitting element of FIG. 1.

FIG. 3 to FIG. 7 are cross-sectional views sequentially showing an embodiment of a manufacturing process of the organic light emitting diode (OLED) display of FIG. 2.

FIG. 8 is an enlarged cross-sectional view of another embodiment of an organic light emitting diode (OLED) display.

DETAILED DESCRIPTION OF CERTAIN INVENTIVE EMBODIMENTS

The present invention will be described more fully hereinafter with reference to the accompanying drawings, in which certain embodiments of the invention are shown. As those skilled in the art would realize, the described embodiments may be modified in various ways, without departing from the spirit or scope of the present invention.

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Like reference numerals generally designate like elements throughout the specification. Further, only elements other than those described with respect to the first embodiment will be described in subsequently described embodiments.

The drawings are schematic and not proportionally scaled. Relative scales and ratios in the drawings may be enlarged or reduced for the purpose of accuracy and convenience, and the scales are random and not limited thereto. In addition, like reference numerals designate like structures, elements, or parts throughout the specification. It will be understood that when an element is referred to as being "on" another element, it can be directly on another element or intervening elements may be present therebetween.

Depicted embodiments views represent certain embodiments in detail. Various modifications of diagrams may be expected. Accordingly, embodiments are not limited to specific shapes of shown regions, and for example, also include modifications of the shape by manufacturing.

An embodiment of an organic light emission display device **101** will be described with reference to FIG. 1 and FIG. 2.

As shown in FIG. 1, an embodiment of an organic light emitting diode (OLED) display **101** has a 2Tr-1Cap structure with an organic light emitting diode **70**, two thin film transistors (TFTs) **10** and **20**, and a capacitor **90** for each pixel area PE. The pixel area PE refers to a region occupied by a pixel as a minimum unit displaying an image. In other embodiments, the display device **101** can be an OLED display having a structure in which at least three thin film transistors and at least two capacitors are arranged in each pixel area PE. The display device **101** can include additional connecting lines such that the display device **101** can have various structures. At least one of additionally formed thin film transistors and capacitors can construct a compensation circuit.

The compensation circuit improves uniformity of the OLEDs **70** formed in the pixel areas PE so as to suppress image quality deviation. The compensation circuit can include two to eight thin film transistors.

In some embodiments, the organic light emitting diode (OLED) display **101** includes a first thin film transistor **10** and a second thin film transistor **20** formed in each pixel area PE. The first thin film transistor **10** and the second thin film transistor **20** respectively include gate electrodes **153** and **156**, active layers **133** and **136**, source electrodes **174** and **177**, and drain electrodes **175** and **178**.

Also, a gate line **151**, a data line **171**, and a common power source line **172** are formed on a substrate **110**. One pixel area PE can be defined by a gate line **151**, a data line **171**, and a common power source line **172**. However, the pixel area PE is not limited thereto. Also, although not shown, a capacitor line may be additionally formed on the substrate **110**.

The data line **171** is connected to the source electrode **174** of the first thin film transistor **10** and the gate line **151** is connected to the gate electrode **153** of the first thin film transistor **10**. A node is formed between the drain electrode **175** of the first thin film transistor **10** and the capacitor **90** such that the drain electrode **175** of the first thin film transistor **10** is connected to a first capacitor electrode **139** of the capacitor **90**. Also, a second capacitor electrode **159** is connected to the common power source line **172**. Further, the drain electrode **175** of the first thin film transistor **10** is connected to the gate electrode **156** of the second thin film transistor **20**. The source electrode **177** of the second thin film transistor **20** is connected to the common power source line **172**, and the drain electrode **178** is connected to an anode of the organic light emitting element **70**.

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The organic light emitting element **70** includes an anode as a hole injection electrode, a cathode as an electron injection electrode, and an organic emission layer **720** disposed between the anode and the cathode. In other embodiments, according to the driving method, the anode and the cathode of the organic light emitting element may be exchanged. In the embodiment of FIG. **1**, the anode is referred to as a pixel electrode **710** and the cathode is referred to as a common electrode line **730**. In the embodiment of FIG. **1**, the common electrode line **730** is formed with a stripe pattern. Also, the pixel electrode **710** can be formed with an isolated patterned.

The first thin film transistor **10** is used as a switch for selecting a pixel area PE to be light-emitted. If the first thin film transistor **10** is instantly turned on, the capacitor **90** is charged and the charged charge amount is proportional to the potential of the voltage applied from the data line **171**. In a state that the first thin film transistor **10** is turned off, the gate potential of the second thin film transistor **20** is increased according to the potential charged to the capacitor **90**. Also, if the gate potential is over a threshold voltage, the second thin film transistor **20** is turned on. Thus, the voltage applied to the common power source line **172** is applied to the organic light emitting element **70** through the second thin film transistor **20**, and thereby the organic light emitting element **70** emits light.

In other embodiments, the constitution of the pixel PE is not limited to as above-described, but may be variously modified.

As shown in FIG. **1**, the gate line **151** is formed in a direction intersecting the data line **171** and the common power source line **172**. The data line **171** and the common power source line **172** are parallel to each other. In addition, the common electrode line **730** of the organic light emitting element **70** intersects the gate line **151**, and is parallel to the data line **171** and the common power source line **172**.

In the embodiment of FIG. **1**, the capacitor **90** is disposed to not overlap the common electrode line **730** of the organic light emitting element **70**. That is, the capacitor **90** is disposed at a space between the common electrode line **730** and the common power source line **172**.

The organic light emitting diode (OLED) display **101** embodiment of FIG. **1** further includes a secondary common power source line **772** formed with the same material as and parallel to the common electrode line **730** on the common power source line **172**. In the embodiment of FIG. **1**, the secondary common power source line **772** is formed directly on the common power source line **172**, as shown in FIG. **2**. The secondary common power source line **772** improves an electric characteristic of the common power source line **172**, that is, the electrical resistance is decreased to suppress a voltage drop.

Next, referring to FIG. **2**, an embodiment of the organic light emitting diode display **101** will be described in detail on the basis of the second thin film transistor **20**, the organic light emitting element **70**, and the capacitor **90** according to the deposition sequence thereof.

In some embodiments, the substrate **110** is formed as a transparent insulating substrate made of glass, quartz, ceramic, or plastic. When the substrate **110** is made of plastic, it can be formed to be a flexible substrate.

A buffer layer **120** is formed on the substrate **110**. The buffer layer **120** is formed to be a single layer or multiple layers including at least one of a silicon oxide layer and a silicon nitride layer by using chemical vapor deposition or physical vapor deposition.

The buffer layer **120** prevents diffusion or penetration of moisture or impurities generated from the substrate **110**,

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smoothes the surface, and controls the transmission speed of heat during a crystallization process for forming a semiconductor layer.

In some embodiments, the buffer layer **120** can be omitted depending on the type of substrate **110** and process conditions.

A semiconductor layer pattern including the active layer **136** and the first capacitor electrode **139** are formed on the buffer layer **120**. The active layer **136** and the first capacitor electrode **139** are formed by depositing and crystallizing an amorphous silicon layer on the buffer layer **120** to form a polysilicon layer, and patterning the polysilicon layer. In other embodiments, the first capacitor electrode **139** may be formed of a different material from that of the active layer **136**. For example, the first capacitor electrode **139** may be formed of a metal.

A gate insulating layer **140** is formed on the active layer **136** and the first capacitor electrode **139**. The gate insulating layer **140** is formed to cover the active layer **136** and the first capacitor electrode **139** on the buffer layer **120**. The gate insulating layer pattern **140** is formed inclusive of various insulating materials, such as, for example, tetraethyl ortho-silicate (TEOS), silicon nitride (SiN_x), and silicon oxide (SiO₂).

A first conductive layer pattern including the gate electrode **156**, the pixel electrode **710**, and the second capacitor electrode **159** is formed on the gate insulating layer **140**. Also, the first conductive layer pattern can further include a gate line **151** (see FIG. **1**).

The gate electrode **156** is formed on the active layer **136** so as to overlap a channel region **1366** of the active layer **136**. The semiconductor layer **136** is divided into the channel region **1366** that is not doped with an impurity, and a source region **1367** and a drain region **1368** disposed on respective sides of the channel region **1366** and doped with an impurity. The gate electrode **156** blocks the channel region **1366** from being doped with an impurity when the impurity is doped into the active layer **136** to form the source region **1367** and the drain region **1368**. Furthermore, the impurity may be doped into the first capacitor electrode **139** when the impurity is doped into the source region **1367** and the drain region **1368** of the active layer **136**.

The gate electrode **156** is formed in a double-layer structure including a gate transparent conductive layer and a gate metal layer formed on the gate transparent conductive layer. The gate metal layer includes at least one of various metallic materials such as molybdenum (Mo), chromium (Cr), aluminum (Al), silver (Ag), titanium (Ti), tantalum (Ta), and tungsten (W). The gate transparent conductive layer includes at least one of transparent conductive layers such as indium tin oxide (ITO), indium zinc oxide (IZO), zinc indium tin oxide (ZITO), gallium indium tin oxide (GITO), indium oxide (In₂O₃), zinc oxide (ZnO), gallium indium zinc oxide (GIZO), gallium zinc oxide (GZO), fluorine tin oxide (FTO), and aluminum-doped zinc oxide (AZO).

The pixel electrode **710** can be formed with the same material and the same layer as the gate transparent conductive layer of the gate electrode **156**.

The second capacitor electrode **159** is disposed on the first capacitor electrode **139**. The gate insulating layer **140** positioned between the first capacitor electrode **139** and the second capacitor electrode **159** functions as a dielectric material. The first capacitor electrode **139**, the gate insulating layer **140**, and the second capacitor electrode **159** form the capacitor **90**.

The second capacitor electrode **159** may be formed with the same material and the same layer as the gate transparent conductive layer, like the pixel electrode **710**.

In other embodiments, the second capacitor electrode **159** can be formed of the multi-layer structure including the gate transparent conductive layer and the gate metal layer, like the gate electrode **156**. The second capacitor electrode **159** can be formed to the second conductive layer pattern that is described below, rather than the first conductive layer pattern.

An interlayer insulating layer **160** is formed on the first conductive layer patterns **151**, **156**, and **159**. The interlayer insulating layer **160** includes at least one of a silicon nitride film and a silicon oxide film. The interlayer insulating layer **160** can be formed in a single layer structure including the silicon nitride film or silicon oxide layer, or in a multi-layer structure including both the silicon nitride film and the silicon oxide film. The interlayer insulating layer **160** can contain hydrogen. The silicon nitride film can contain hydrogen in terms of process conditions. The interlayer insulating layer **160** can execute a function of providing hydrogen to the semiconductor layers **133** and **136** during annealing of the semiconductor layers **133** and **136** to achieve smooth annealing, in addition to having an insulating function.

In other embodiments, the interlayer insulating layer **160** may use an organic film, rather than the inorganic layer such as the silicon nitride film and the silicon oxide film. When forming the organic film as the interlayer insulating layer **160**, the first insulation layer **170** can be formed to be relatively thick. The interlayer insulating layer **160** can be formed to have a substantial thickness so as to acquire stable inter-layer insulation.

The interlayer insulating layer **160** may be formed with a plurality of layers all including the inorganic film and the organic film.

The interlayer insulating layer **160** has a pixel interlayer opening region **163** exposing a portion of the pixel electrode **710**. The gate metal layer formed on the gate transparent conductive layer can be removed in the process of forming the pixel electrode **710** through the pixel interlayer opening region **163** of the interlayer insulating layer **160**.

The interlayer insulating layer **160** has a capacitor opening region **169** formed on the second capacitor electrode **159**. The gate metal layer formed on the gate transparent conductive layer can be removed in the process of forming the second capacitor electrode **159** through the capacitor opening region **169** of the interlayer insulating layer **160**.

The interlayer insulating layer **160** and the gate insulating layer **140** have a plurality of contact holes **167** and **168** exposing a portion of the active layer **136**. The plurality of contact holes **167** and **168** expose a portion of the source region **1367** and the drain region **1368** of the active layer **136**.

The second conductive layer pattern, including the data line **171** (see FIG. 1), the common power source line **172**, the source electrode **177**, and the drain electrode **178**, is formed on the interlayer insulating layer **160**. In some embodiments, the second capacitor electrode **159** can be included in the second conductive layer pattern.

The second conductive layer pattern can include at least one of various metallic materials.

The source electrode **177** and the drain electrode **178** contact the source region **1367** and the drain region **1368** of the active layer **136** through the contact holes **167** and **168**, respectively.

A protecting insulating layer **180** is formed on the second conductive layer patterns **171**, **172**, **176**, and **178**. The protecting insulating layer **180** can be formed of various materials.

The protecting insulating layer **180** has a pixel protecting opening region **183** exposing a portion of the pixel electrode **710** along with the pixel interlayer opening region **163** of the interlayer insulating layer **160**. The protecting insulating layer **180** has a line opening region **188** exposing the common power source line **172**.

A pixel defining layer **190** is formed on the protecting insulating layer **180**. The pixel defining layer **190** includes a pixel opening **193** exposing a portion of the pixel electrode **710** along with the pixel protecting opening region **183** of the protecting insulating layer **180** and the pixel interlayer opening region **163** of the interlayer insulating layer **160**, and a line opening **198** exposing the common power source line **172** along with the line opening region **188** of the protecting insulating layer **180**.

The pixel defining layer **190** can be formed of various organic or inorganic materials. For example, the pixel defining layer **190** can be formed through thermal hardening or photohardening after patterning a photosensitive organic layer.

The organic emission layer **720** is formed on the pixel electrode **710** in the pixel opening **193** of the pixel defining layer **190**.

The common electrode line **730** is formed on the organic emission layer **720** and is parallel to the data line **171** and the common power source line **172**. The common electrode line **730** is disposed to not overlap the first capacitor electrode **139** and the second capacitor electrode **159**.

The pixel electrode **710**, the organic emission layer **720**, and the common electrode line **730** form the organic light emitting diode **70**. The pixel opening **193** of the pixel defining layer **190** where the pixel electrode **710**, the organic emission layer **720**, and the common electrode line **730** are sequentially deposited forms a light emitting region where the organic light emitting diode **70** emits light.

The secondary common power source line **772** is formed on the common power source line **172** according to the common power source line **172**. The secondary common power source line **772** is disposed inside the line opening region **198** of the pixel defining layer **190** and the line opening region **188** of the protecting insulating layer **180**. The secondary common power source line **772** is formed with the same material as the common electrode line **730**. The secondary common power source line **772** can be formed parallel to the common electrode line **730**.

As described above, in the embodiment of FIG. 1, the secondary common power source line **772** is formed to directly contact the common power source line **172**.

By the above-described constitution, in one embodiment of the organic light emitting diode (OLED) display **101**, the common electrode line **730** and the capacitor **90** do not overlap such that generation of unnecessary parasitic capacitance is minimized. Also, the voltage drop is suppressed by the secondary common power source line **772**.

Next, referring to FIG. 3 to FIG. 7, an embodiment of a manufacturing method of the organic light emitting diode (OLED) display **101** will be described.

Firstly, as shown in FIG. 3, a transparent insulating substrate **110** made of glass, quartz, ceramic, or plastic is provided, and a buffer layer **120** is formed on the substrate **110**. The buffer layer **120** can be as a single-layered structure based on silicon nitride (SiNx), or a double-layered structure based on silicon nitride (SiNx) and silicon oxide (SiO₂).

Next, a semiconductor layer pattern including an active layer **136** and a first capacitor electrode **139** is formed on the buffer layer **120**. The semiconductor layer pattern (**136** and **139**) can be formed by depositing amorphous silicon on the

buffer layer **120**, crystallizing the amorphous silicon layer to form a polysilicon layer, and patterning the polysilicon layer.

The amorphous silicon layer is crystallized using one of various crystallization methods including solid phase crystallization, excimer laser crystallization, metal induced crystallization (MIC), metal induced lateral crystallization (MILC), and super grain silicon (SGS) crystallization.

Next, a gate insulating layer **140** covering the semiconductor layer patterns **136** and **139** is formed. Also, a gate transparent conductive layer and a gate metal layer are sequentially deposited on the gate insulating layer **140**.

Next, as shown in FIG. **4**, the gate transparent conductive layer and the gate metal layer are patterned to form a gate electrode **156**, a pixel electrode intermediate member **7100**, and a second capacitor electrode intermediate member **1590**. The gate electrode **156**, the pixel electrode intermediate member **7100**, and the second capacitor electrode intermediate member **1590** are formed with a multi-layer structure in which the gate transparent conductive layer and the gate metal layer are sequentially deposited.

Next, the active layer **136** is doped with an impurity. The active layer **136** is divided into a channel region **1366** where the impurity is not doped, and source regions **1367** and drain regions **1368** where the impurity is doped. The gate electrode **156** prevents the impurity from being doped to the channel region **1366** of the active layer **136**. A portion of the first capacitor electrode **139** is also doped with the impurity.

Next, as shown in FIG. **5**, an interlayer insulating layer **160** is formed on the gate electrode **156**, a pixel electrode intermediate member **7100**, and a second capacitor electrode intermediate member **1590**. The interlayer insulating layer **160** can be made of the inorganic layer including at least one of the silicon nitride layer and the silicon oxide or the organic layer. Also, the interlayer insulating layer **160** can include the inorganic layer and the organic layer.

Next, a plurality of contact holes **167** and **168** are formed in the interlayer insulating layer **160**. The gate insulating layer **140** is also partially removed to expose the source region **1367** and the drain region **1368** of the active layer **136** through the contact holes **167** and **168** of the interlayer insulating layer **160**.

Also, a pixel interlayer opening region **163** and a capacitor opening region **169** exposing the pixel electrode intermediate member **7100** and the second capacitor electrode intermediate member **1590** are formed in the interlayer insulating layer **160**.

In FIG. **5**, the capacitor opening region **169** completely exposes the second capacitor electrode intermediate member **1590**. In other embodiments, the capacitor opening region **169** may be equal to or smaller than the second capacitor electrode intermediate member **1590**.

Next, as shown in FIG. **6**, the gate metal layer of the pixel electrode intermediate member **7100** and the second capacitor electrode intermediate member **1590** exposed through the pixel interlayer opening region **163** and the capacitor opening region **169** is removed to complete the pixel electrode **710** and the second capacitor electrode **159**.

Also, the other portion of the first capacitor electrode **139** is doped with the impurity. The second capacitor electrode **159** is formed with the gate transparent conductive layer such that the impurity can be passed through the second capacitor electrode **159** and can be doped to the first capacitor electrode **139**.

Next, on the interlayer insulating layer **160**, the second conductive layer pattern including a source electrode **177**, a drain electrode **178**, a data line (**171**, shown in FIG. **1**), and a common power source line **172** is formed. The source elec-

trode **177** and the drain electrode **178** contact the source region **1367** and the drain region **1368** of the active layer **136** through a plurality of contact holes **167** and **168**.

Next, as shown in FIG. **7**, a protecting insulating layer **180** is formed on the second conductive layer pattern. The protecting insulating layer **180** has a pixel protecting opening region **183** exposing a portion of the pixel electrode **710** and a line opening region **188** exposing the common power source line **172** along with the pixel interlayer opening region **163** of the interlayer insulating layer **160**.

Next, a pixel defining layer **190** is formed on the protecting insulating layer **180**. The pixel defining layer **190** has a pixel opening **193** exposing a portion of the pixel electrode **710** along with the pixel interlayer opening region **163** of the interlayer insulating layer **160** and the pixel protecting opening region **183** of the protecting insulating layer **180**, and a line opening **198** exposing the common power source line **172** along with the line opening region **188** of the protecting insulating layer **180**.

Next, an organic emission layer is formed on the pixel electrode **710** exposed through the pixel opening **193** of the pixel defining layer **190**.

Next, as previously as shown in FIG. **2**, a common electrode line **730** is formed on an organic emission layer **720** and a secondary common power source line **772** is formed on the common power source line **172** exposed through the line opening **198** of the pixel defining layer **190**. The common electrode line **730** and the secondary common power source line **772** are formed together with the same material. The secondary common power source line **772** improves an electrical characteristic of the common power source line **172** so as to suppress the voltage drop of the organic light emitting diode (OLED) display **101**.

Through the above-described manufacturing method, the organic display device **101** can be manufactured. Accordingly, the organic light emitting diode (OLED) display **101** can have minimized generation of unnecessary parasitic capacitance and can suppress the voltage drop.

Next, another embodiment of a display device **102** will be described with reference to FIG. **8**.

As shown in FIG. **8**, in the organic light emitting diode (OLED) display **102**, a secondary common power source line **772** is formed on a common power source line **172** via a protecting insulating layer **180**. The protecting insulating layer **180** does not have the line opening region.

The secondary common power source line **772** and the common power source line **172** disposed via the protecting insulating layer **180** therebetween may be used as a secondary capacitor of a metal-insulator-metal (MIM) structure.

By this constitution, in the organic light emitting diode (OLED) display **102**, the common electrode line **730** and the capacitor **90** do not overlap each other such that the generation of the unnecessary parasitic capacitance is minimized. Also, the common power source line **172** and the secondary common power source line **772** can be used as the secondary capacitor.

Further, the manufacturing method of the organic light emitting diode (OLED) display **102** is the same as the embodiment of FIG. **1**, except that the line opening region is not formed in the protecting insulating layer **180**.

While this disclosure has been described in connection with certain embodiments, it is to be understood that the invention is not limited to the disclosed embodiments, but, on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims.

Description of Symbols	
10, 20: thin film transistor	70: organic light emitting element
90: capacitor	101, 102: display device
110: substrate	120: buffer layer
136: active layer	139: first capacitor electrode
140: gate insulating layer	151: gate line
156: gate electrode	159: second capacitor electrode
160: interlayer insulating layer	171: data line
172: common power source line	177: source electrode
178: drain electrode	180: protecting insulating layer
190: pixel defining layer	710: pixel electrode
720: organic emission layer	730: common electrode line
772: secondary common power source line	
PE: pixel area	

What is claimed is:

1. An organic light emitting diode (OLED) display comprising:

- a substrate;
- a first thin film transistor and a second thin film transistor both disposed on the substrate and both having an active layer, a gate electrode, a source electrode, and a drain electrode;
- a gate line connected to the gate electrode of the first thin film transistor;
- a data line connected to the source electrode of the first thin film transistor and intersecting the gate line;
- a common power source line connected to the source electrode of the second thin film transistor, intersecting the gate line, and parallel to the data line;
- a pixel electrode connected to the drain electrode of the second thin film transistor;
- an organic emission layer disposed on the pixel electrode;
- a common electrode line disposed on the organic emission layer and parallel to the data line and the common power source line;
- a secondary common power source line formed with the same material as and parallel to the common electrode line and disposed on the common power source line; and
- a capacitor disposed between the common electrode line and the secondary common power source line, wherein the common electrode line and the capacitor do not overlap in a top view.

2. The organic light emitting diode (OLED) display of claim 1, wherein:

the capacitor comprises:

- a first capacitor electrode formed with the same layer as the active layer of the first thin film transistor and the second thin film transistor and connected to the drain electrode of the first thin film transistor and the gate electrode of the second thin film transistor; and
- a second capacitor electrode formed with the same layer as the pixel electrode and the gate electrode and connected to the source electrode of the second thin film transistor and the common power source line.

3. The organic light emitting diode (OLED) display of claim 1, wherein the secondary common power source line is formed directly on the common power source line.

4. The organic light emitting diode (OLED) display of claim 1, further comprising a protecting insulating layer disposed between the secondary common power source line and the common power source line.

5. An organic light emitting diode (OLED) display comprising:

a substrate;

a semiconductor layer pattern formed on the substrate and including an active layer and a first capacitor electrode; a gate insulating layer formed on the semiconductor layer pattern;

a first conductive layer pattern disposed on the gate insulating layer and including a gate line, a pixel electrode, a gate electrode, and a second capacitor electrode;

an interlayer insulating layer disposed on the first conductive layer pattern and having a pixel interlayer opening region exposing a portion of the pixel electrode;

a second conductive layer pattern including a source electrode, a drain electrode, a data line, and a common power source line disposed on the interlayer insulating layer;

a protecting insulating layer disposed on the second conductive layer pattern and having a pixel protecting opening region exposing a portion of the pixel electrode;

a pixel defining layer disposed on the protecting insulating layer and having a pixel opening exposing a portion of the pixel electrode along with the pixel interlayer opening region and the pixel protecting opening region, and a line opening disposed on the common power source line;

an organic emission layer disposed on the pixel electrode exposed through the pixel opening of the pixel defining layer;

a common electrode line disposed on the organic emission layer and not overlapping with either a first capacitor electrode or a second capacitor electrode;

a secondary common power source line disposed along the common power source line in the line opening of the pixel defining layer; and

a capacitor disposed between the common electrode line and the secondary common power source line, wherein the common electrode line and the capacitor do not overlap in a top view.

6. The organic light emitting diode (OLED) display of claim 5, wherein the secondary common power source line is formed on the common power source line via the protecting insulating layer.

7. The organic light emitting diode (OLED) display of claim 5, wherein the protecting insulating layer further includes a line opening region exposing the common power source line along with the line opening of the pixel defining layer.

8. The organic light emitting diode (OLED) display of claim 7, wherein the secondary common power source line is disposed directly on the common power source line.

9. The organic light emitting diode (OLED) display of claim 5, wherein the common electrode line intersects the gate line and is parallel to the data line and the common power source line.

10. A method of manufacturing an organic light emitting diode (OLED) display, comprising:

providing a substrate;

forming a semiconductor layer pattern including an active layer and a first capacitor electrode on the substrate;

forming a gate insulating layer on the semiconductor layer pattern;

forming a first conductive layer pattern including a gate line, a pixel electrode, a gate electrode, and a second capacitor electrode on the gate electrode;

forming an interlayer insulating layer having a pixel interlayer opening region exposing a portion of the pixel electrode on the first conductive layer pattern;

forming a second conductive layer pattern including a source electrode, a drain electrode, a data line, and a

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common power source line on the interlayer insulating layer;
 forming a protecting insulating layer having a pixel protecting opening region exposing a portion of the pixel electrode along with the pixel interlayer opening region on the second conductive layer pattern;
 forming a pixel defining layer having a pixel opening exposing a portion of the pixel electrode along with the pixel interlayer opening region and the pixel protecting opening region, and a line opening formed on the common power source line on the protecting insulating layer;
 forming an organic emission layer on the pixel electrode exposed through the pixel opening of the pixel defining layer;
 forming a common electrode line that does not overlap a first capacitor electrode and a second capacitor electrode on the organic emission layer in a top view;

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forming a secondary common power source line according to the common power source line in the line opening of the pixel defining layer.

11. The method of claim **10**, wherein the secondary common power source line is formed on the common power source line via the protecting insulating layer.

12. The method of claim **10**, wherein the protecting insulating layer further includes a line opening region exposing the common power source line along with the line opening of the pixel defining layer.

13. The method of claim **12**, wherein the secondary common power source line is formed directly on the common power source line.

14. The method of claim **10**, wherein the common electrode line intersects the gate line and is parallel to the data line and the common power source line.

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